

of many minor points of interest in the volume before us, but we hope to refer to the subject again when the second portion of Mr. Thompson's work appears. Meanwhile, the book may be commended to all students of folk-lore, as well as to the Semitic philologist and anthropologist.

LINE GEOMETRY.

A Treatise on the Line Complex. By C. M. Jessop. Pp. xv+364. (Cambridge: University Press, 1903.) Price 10s. net.

THE systematic study of what is now called line geometry was begun by Plücker in his "Neue Geometrie des Raumes." There was, it is true, a fairly complete theory of the linear complex due to Chasles and others before the publication of Plücker's work, and the geometry of systems of lines (congruences) has in some respects not progressed very much since the date of Kümmer's celebrated memoir, but it was only after the idea of line coordinates had been introduced that the essential qualities of the new geometry were recognised.

In his treatise on the line complex, Mr. Jessop has aimed at presenting the extensive investigations of German and Italian geometers in a form easily accessible to the English student of mathematics. It has been found necessary to write an introductory chapter on the elementary methods of synthetic geometry that are used in the book; then the next four chapters contain the theory of line coordinates, in the general form introduced by Klein, and the linear complex. A great portion of these chapters will be familiar to anyone who has studied the theory of forces in three dimensions with attention; the only omission that occurs to us is a number of easy exercises on the use of line coordinates, particularly in the ordinary Cartesian form, but this defect is partly remedied by an excellent collection of examples at the end of the book.

The theory of the quadratic complex is naturally the most important part of the book—the linear complex is too well known, and the higher complexes too difficult to deal with, to illustrate the methods of the subject. The author has devoted six ample chapters (vi.-xi.) to this theory. Chapter vi. deals mainly with the singular surface, which is remarkable in all complexes as being both the locus of singular points and the envelope of singular planes. Two proofs of the identity of this locus and envelope are given, one depending on von Staudt's theorem concerning a tetrahedron, and the other on infinitesimal properties. The first is particularly interesting although peculiar to the quadratic complex, because a tetrahedron being the simplest form of the singular surface, von Staudt's theorem is a particular case of a property of Kümmer's quartic from which the result follows; the other proof can be extended readily to any complex (chapter xvii.). The discussion of Kümmer's quartic is the author's own, and will be very welcome to the beginner as being both elementary and direct.

It is curious that an infinite number of quadratic complexes have the same singular surface, the theory

being similar to that of confocal quadrics. Such cosingular complexes are discussed in chapter viii., and by developing the idea of corresponding lines in cosingular complexes Mr. Jessop has obtained some very interesting and novel proofs. Another chapter deals with the beautiful classification of quadratic complexes, and contains an exposition of Darboux's proof of the fundamental theorem of Weierstrass on the equivalence of quadratic forms.

In chapter vii. an account of some special complexes is given, the greater part of the space being devoted to the tetrahedral complex; this complex was studied long before the introduction of line coordinates, and lends itself readily to synthetic treatment.

In another part of the book it is shown that a tetrahedral complex can always be found which contains the complete intersection of a quadratic complex and a linear complex. Substantially this important result is due to Kümmer, but the first complete account of it we owe to Caporali.

Only two chapters on congruences appear in the work; this part of the subject is difficult, because the analytical methods are clumsy when applied to such congruences as are not complete intersections of complexes, and the purely synthetic methods of Sturm and others are extremely tedious. Mr. Jessop follows Kümmer on the general principles, and only gives a detailed account of the simplest congruence, namely, that of the second order and the second class.

The latter portion of the book does not strike us as being so attractively arranged as the earlier parts, but the final chapter on the connection of line geometry and differential equations is valuable as an introduction to Lie's theories.

There is no doubt that the book will be a boon to a student of the subject, and that anyone with a taste for geometry will find much that is interesting and something that is new in it.

J. H. G.

OUR BOOK SHELF.

Geological Rambles in East Yorkshire. By Thomas Sheppard, F.G.S. Pp. xi+235; 53 illustrations and geological map. (London: A. Brown and Sons, 1903.)

THIS is a pleasantly written and attractive guide to the geology of east Yorkshire, the work of a sturdy local geologist who shows himself to be master of his subject and of the literature past and present. Under his enthusiastic leadership we are taken from Hull to the out-of-the-world promontory of Spurn Head, where we learn many lessons about recent geological changes. Thence we are conducted northwards to Withernsea and Hornsea, examining some of the finest sections in the Boulder-clay of Yorkshire; successive beds of drift with transported mollusca and Scandinavian rocks, deposits with local detritus, and others with rocks from the Cheviots and elsewhere. We see also lacustrine deposits and peat beds, remains of old lakes, of which Hornsea Mere alone appears to survive. Then we are taken on to Bridlington, noted for its shelly "Crag," really a part of the basement Glacial drift, which is now hidden behind a strong sea-wall. The buried cliff of Sewerby, with its basement clay and older mammaliferous deposit yielding *Elephas antiquus*, hippopotamus, rhinoceros, &c., claims attention. From this we pass on to the fine

Chalk cliffs of Flamborough Head, beginning near Sewerby with beds which are rich in sponges and yield also Marsupites, and we continue along the headland to lower divisions of Chalk at Selwick, Thornwick and Bempton, and finally to the base with its Red Chalk at Speeton. Here, amid a region of landslips, we notice one slip on the part of the author (p. 61), where he refers to the Red Chalk of Cromer, meaning, of course, Hunstanton. The Speeton Clay, as unravelled by Mr. G. W. Lamplugh, is duly described, from the Gault through the Lower Cretaceous which constitutes the Speeton Clay proper, to the Kimeridge Clay. From this tract we are taken to the Corallian rocks of Filey Brigg, and on to Gristhorpe and Scarborough, where the work of Mr. W. H. Hudleston and Mr. Fox-Strangways, as well as that of earlier geologists, is duly mentioned.

Thus all the Jurassic divisions are in turn described as we proceed along the coast, as the author takes us to the Lias of Robin Hood's Bay, Whitby and Redcar. He then brings us back to the Humber, discourses on the warp, which is material not carried down by the rivers, but derived from the waste of the Boulder-clay cliffs and brought in by the tide. From Hull again to Hessele we see more of Glacial drifts; we are taken over the Oolites of Brough and South Cave, and across the Yorkshire Wolds, the charms of which are well described, and thence we come back to Holderness.

The work is admirably illustrated with photographic views, many of them taken by Mr. Godfrey Bingley, and from its clear and accurate descriptions it is well calculated to rouse up and foster an interest in geology.

Les Produits coloniaux d'Origine animale (Bibliothèque Coloniale). By H. J. de Cordemoy. Pp. viii + 396; illustrated. (Paris: Baillière et Fils, 1903.) Price 5 francs.

THE object of the series of which the volume before us forms a part is to bring before the French public in an interesting and popular style the origin of the foreign food supplies and products used in the arts and commerce, and more especially those which are yielded by their own colonies. The idea is an excellent one which might well be copied in this country, and, so far as at any rate as the present volume is concerned, the Colonial Institute of Marseilles, to which the series owes its conception, is to be congratulated on the project.

The author of the present volume divides his subject into two main headings, the one including foreign food supplies and the other all colonial products of animal origin employed in French industries and arts. As regards the first section, attention is concentrated in one chapter on the manufacture of beef-essence in Madagascar and New Caledonia, while the second, and much larger one, is devoted to fish and fishing, and such special products as edible swallow-nests, béche-de-mer, &c. The most valuable fishery appears to be that for thunny on the Tunisian coast, the concession for which is let to Count Raffo for forty years at an annual rent of 5400 francs. The most remarkable fishery at Tunis is that of octopus. Poor food one would think; but it appears that in Greece and Crete there are two annual fasts, during which the consumption, not only of meat, but of fish and the flesh of all animals "having blood is prohibited." As the octopus is not considered to come within this prohibition, it forms, in a dried condition, an important food supply during the seasons in question.

As regards the second and much larger section of the work, limitations of space render anything approaching a detailed notice an impossibility. It must suffice, therefore, to state that this section is subdivided into three groups. Under the first, which includes products used in leather and textile manufac-

tures, as well as for dress and ornament, are classed silk, hides, furs, hair, wool, feathers, ivory, coral, sponge, tortoiseshell, mother-of-pearl, horn, &c. In the second group are ranged wax, fat, oil, gelatin, and perfumes; while the third and last group is devoted to resinous products, such as lac, and the dyes afforded by the cochineal insect and other animals.

While congratulating the author on the amount of information he has conveyed in a small space, and on the interesting manner in which this is described, we venture to think that the illustrations, some of which are too large for the pages, are hardly up to modern methods and requirements.

R. L.

A Text-book of Botany. By Dr. E. Strasburger, Fritz Noll, H. Schenck, and the late A. F. W. Schimper. Second edition, revised with the fifth German edition, by W. H. Lang. Pp. ix + 671; with 686 illustrations, in part coloured. (London: Macmillan and Co., Ltd., 1903.) Price 18s. net.

THE new edition of the English version of the "Bonn Text-book" is based on the fifth German edition. It marks an improvement on its predecessor, and is brought well up-to-date as regards the text, whilst we also note an improvement in the figures, some of the older illustrations having been omitted or replaced by better ones. The coloured representations, however, do not strike us as very useful, and we would have willingly seen them disappear.

The principal innovation in the present volume consists in the inclusion of a bibliography, which, without pretending to be complete, cannot fail to be of use to the serious student who wishes to find his way about the literature of the science.

The popularity already enjoyed by this treatise (in spite of defects inherent in any attempt to compress a big subject into the narrow limits of a single volume) is well deserved, and Dr. Lang is to be congratulated on the excellence with which he has carried out his share in presenting the book to English students.

Bacteria in Milk and its Products. By Prof. H. W. Conn, Ph.D. Pp. vii + 306. (London: Rebman, Ltd., 1903.) Price 6s. net.

THIS little book gives an excellent account of the relation between milk and its products and bacteria and allied organisms. It is written in simple language, and might be read with profit by those engaged in the "milk" industries who have had little scientific training. After a few introductory pages upon the nature of bacteria, the bacterial contamination of normal milk is discussed, and plain directions are given for its reduction, milk vessels, water supply, milking, cooling, and the sanitary control of dairies being all dealt with. The various fermentations that occur in milk, milk from diseased cows, the sterilisation of milk, cream ripening, artificial starters, butter and cheese, are some of the subjects considered in later chapters, and the book concludes with directions for the bacteriological analysis of milk and for some of the simpler chemical determinations. A full bibliography is appended, but the titles are too contracted; in many instances it is difficult to recognise the publication to which reference is made.

R. T. HEWLETT.

Junior Algebra Examination Papers. By S. W. Finn. Pp. vi + 87. (London: Methuen and Co., 1903.) Price 1s.

THE seventy-two examination papers contained in this little book are modelled on questions set at such school examinations as the university locals. The questions are graduated, and full answers are supplied. A useful table of contents enables the teacher to discover rapidly the scope of the different test papers.